

Addressing the crisis of GP recruitment and retention:

a systematic review

Abstract

Background

The numbers of GPs and training places in general practice are declining, and retaining GPs in their practices is an increasing problem.

Aim

To identify evidence on different approaches to retention and recruitment of GPs, such as intrinsic versus extrinsic motivational determinants.

Design and setting

Synthesis of qualitative and quantitative research using seven electronic databases from 1990 onwards (Medline, Embase, Cochrane Library, Health Management Information Consortium [HMIC], Cumulative Index to Nursing and Allied Health Literature [Cinahl], PsycINFO, and the Turning Research Into Practice [TRIP] database).

Method

A qualitative approach to reviewing the literature on recruitment and retention of GPs was used. The studies included were English-language studies from Organisation for Economic Cooperation and Development countries. The titles and abstracts of 138 articles were reviewed and analysed by the research team.

Results

Some of the most important determinants to increase recruitment in primary care were early exposure to primary care practice, the fit between skills and attributes, and a significant experience in a primary care setting. Factors that seemed to influence retention were subspecialisation and portfolio careers, and job satisfaction. The most important determinants of recruitment and retention were intrinsic and idiosyncratic factors, such as recognition, rather than extrinsic factors, such as income.

Conclusion

Although the published evidence relating to GP recruitment and retention is limited, and most focused on attracting GPs to rural areas, the authors found that there are clear overlaps between strategies to increase recruitment and retention. Indeed, the most influential factors are idiosyncratic and intrinsic to the individuals.

Keywords

general practice; intrinsic motivation; job satisfaction; primary health care; recruitment; retention; review, systematic.

INTRODUCTION

The UK government and professional bodies have become increasingly concerned about the declining numbers of GPs. The reasons for this are thought to be related to problems in training, low GP morale, increasing workload pressures on practices, challenges of changing roles, and reductions in pay.¹⁻⁴

The number of GPs per 100 000 head of population across England declined from 62 in 2009 to 59.5 in 2012.⁵ Despite Department of Health policy to increase GP training numbers in England to 3250 per annum, GP recruitment has remained persistently below this target, at around 2700 per annum, and since 2005 there has been a gradual decline in the percentage of students choosing general practice as a first choice.⁶ Despite a recruitment record of 2989 in 2015–2016, Health Education England (H) missed their recruitment goal of 3250 new GP trainees.⁷ Although applications for general practice post-qualifying have substantially increased in 2016, the problem remains in some areas, such as in the North East, North West, and Midlands.^{7,8} This reduction is set against an increasing GP workload due to changing health needs and policies designed to develop more primary and community-based health care.⁹⁻¹²

Additional pressure arises from an increase in the numbers of GPs leaving general practice, including an increase in those considering practising abroad.^{13,14} Together, under-recruitment of GPs and increased propensity to leave are key factors

in the current GP shortage. To address this, NHS England — working with HEE, the Royal College of General Practitioners (RCGP), and the British Medical Association (BMA) — in 2015 published *Building the Workforce — the New Deal for General Practice*,¹⁵ where they presented the 10-point plan, then in 2016 the *General Practice Forward View*,¹⁶ both proposing strategies to increase recruitment and reduce turnover in general practice through specific initiatives and further investment in general practice.

As part of the development work for reviewing the 10-point plan and NHS England's strategy, the Policy Research Unit in Commissioning and the Healthcare System (PRUComm) was asked to review the existing evidence on GP recruitment and retention.¹⁷ The review explored the main dimensions related to recruitment and retention of GPs to identify the intrinsic and extrinsic motivational factors connected to career choices and retention. This study reports on the main findings of the review.

METHOD

To identify relevant evidence, the authors undertook a structured review that synthesised the evidence from reviews on primary care physician recruitment and retention from countries with similar health systems to the UK (for example, Canada and Australia), and UK studies specifically examining GP recruitment and retention and GP training (search terms are outlined in Appendix 1). Articles published in English from 1990 onwards were included.

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How this fits in

To support the work of NHS England and Health Education England on the development of the *Five Year Forward View*, the Department of Health commissioned a review of the evidence of the 10-point plan from *Building the Workforce — the New Deal for General Practice* from the Policy Research Unit in Commissioning and the Healthcare System. The review examined the evidence on GP recruitment and retention determinants, and found that intrinsic and idiosyncratic factors, such as job satisfaction, were more important than extrinsic factors, such as financial incentives.

Following an initial review, the terms were searched as keywords (appearing in title, abstract, subject, and keyword heading fields) and also mapped against MeSH subject headings, where applicable, to ensure comprehensive coverage. The databases searched were Medline, Embase, Cochrane Library, Health Management Information Consortium (HMIC), Cumulative Index to Nursing and Allied Health Literature (Cinahl), PsycINFO, and the Turning Research Into Practice (TRIP) database (an internet-based source of evidence-based research). The literature search included all journal articles, systematic reviews, meta-analyses, review articles, reports, and grey literature (Table 1 contains the search results). The authors also expanded their data collection to undertake more in-depth searching of the grey literature and conducted hand searches of key journals to provide a more comprehensive analysis and evidence base for policy development. The search was restricted to English-language studies in journals from countries that are part of the Organisation for Economic Cooperation and Development (OECD), and selected articles generally came from

countries with similar healthcare systems, such as Canada and Australia.

Duplicates were deleted and a basic initial weeding process was undertaken to exclude irrelevant papers. The research team reviewed the titles and abstracts of identified articles to select relevant studies for inclusion in the review. Original research papers and empirical studies (Figure 1¹⁸) were reviewed, both from the UK and from other countries where relevant.

RESULTS

There was a degree of overlap between studies that examined retention and which also studied recruitment. However, in order to set the evidence on recruitment and retention determinants, these are presented separately.

Recruitment in general practice

Studies that examine specific recruitment strategies for the GP workforce are scarce.¹⁹ This review suggests that most studies on primary care physician recruitment (for example, GPs and family doctors) have predominantly focused on remote rural locations. However, the authors identified a number of studies that examined the determinants influencing recruitment that would be relevant to general practice. These can be characterised in terms of how they relate to the individual, institutional, and professional contexts of recruitment.

In a study of career choices, Shadbolt and Bunker²⁰ presented determinants that are mainly intrinsic to the individual. These intrinsic factors include physicians' self-awareness of their skills, and the factors associated with career orientations or choices. These are influenced by demographic variables, lifestyle orientation, and the opportunities for learning and educational development,^{20–23} suggesting that medical graduates primarily look for a career that is stimulating and interesting. One study found that medical students were more attracted towards biomedical or technical forms of medical practice, as opposed to a more holistic form of medicine.²¹

Medical students exposure to, and experience of, general practice has an important effect on preferences for a career in general practice. The authors identified a number of studies that highlighted the important influence on recruitment of the workplace experience, stressing the need for a positive experience from interactions with members of the profession, the length of time spent in general practice, the quality of the practice, and the dedication of the

Table 1. Search results

Database	Studies, <i>n</i>
Medline, Embase, and Cochrane (reviews, meta-analyses)	129
HMIC (reports, policy documents, and grey literature)	270
Medline, Embase, and Cochrane (journal articles)	879
PsycINFO	351
Cinahl	43
TRIP	30

Cinahl = Cumulative Index to Nursing and Allied Health Literature. *HMIC* = Health Management Information Consortium. *TRIP* = Turning Research Into Practice.

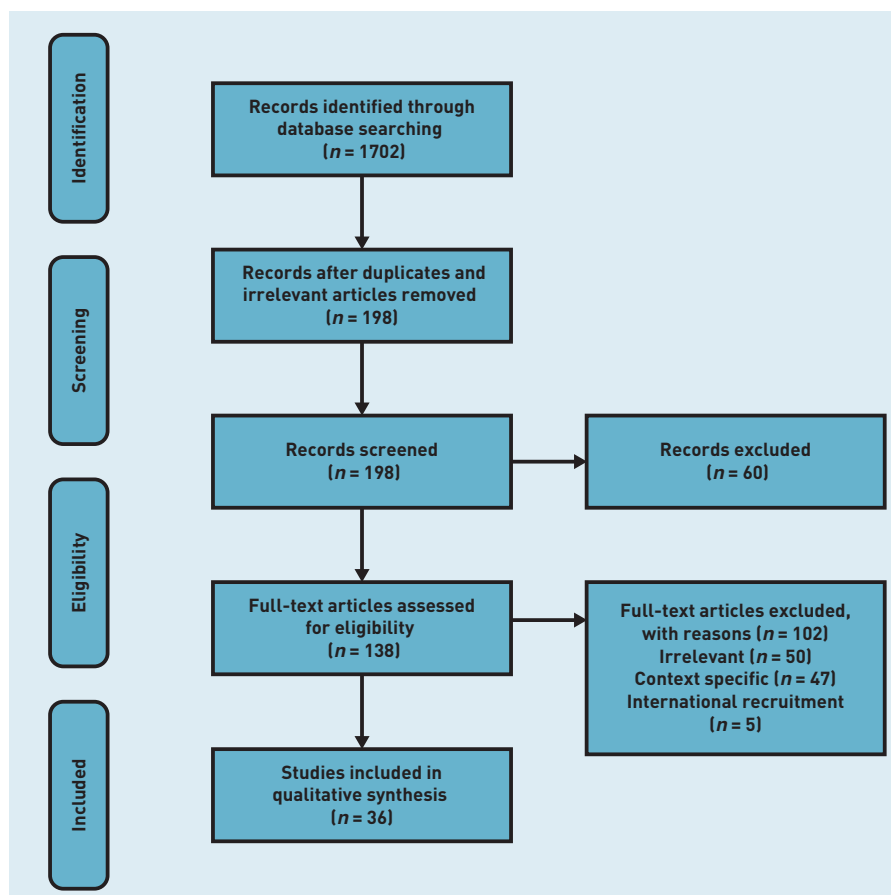


Figure 1. Flow chart of identification and inclusion of studies for review. Adapted with permission from the PRISMA statement.¹⁸

generalists' faculty.^{19–21,24–29} In particular, positive experiences were linked to an increased likelihood to choose general practice; especially when the experience occurred at the pre-clinical or early stage.^{25,29}

Similarly, Campos-Outcalt *et al*³⁰ found that the best strategies to enlarge the proportion of medical students choosing generalist careers included reform of the medical school curricula with emphasis on generalist training, increasing the size of generalist faculties, and ensuring there is clinical training in family practice training. There is some evidence to show that implementing effective medical school curricula in primary care and establishing primary care honours tracks, developing or expanding primary care fast-track programmes, and developing curricula proposing portfolio careers and profile of new skills^{20,28,30,31} influences students' career choices. Currently, medical training delivered in general practice, and the proportion of the medical school budget made available for its teaching, is lower than the time dedicated to, and resources available for, teaching related to secondary care.²

Two studies focused on the effect of the modification of admission criteria to

identify potential students who are more likely to choose primary care specialisation as part of student selection. They proposed that assessing the community of origin and previous experience of, or interest in, people and social concerns, and discussing future specialty choices be integrated into the admission process.^{32,33} Providing financial support to students choosing poorly recruiting areas of practice has been shown to have a negative impact on retaining those students when in practice.³⁴ However, increases in student debt from higher tuition fees may make such schemes more attractive, although further research is required.^{20,27}

Factors influencing recruitment are related to the clinical content, perceived lifestyle, and work context. The clinical content of the role is one of the most important factors influencing career choices.²³ Given this dominance, the negative view of general practice held by medical students — that it is less intellectually stimulating — may explain the lack of interest in this career choice.^{20,23} However, Chellappah and Garnham²¹ concluded that students at the end of their training have a positive image of general practice, suggesting that students' views change during medical training, but choices regarding eventual specialty are taken earlier in medical school, before these more positive views are formed.

Work climate and work context, such as the support from colleagues, autonomy, flexibility and independence, proximity with patients, the continuity of care, and health promotion, are also key factors affecting recruitment.^{20,21,23,35,36} Compatibility with family life and the medical breadth of the discipline also positively influence choosing general practice.³⁶

Shadbolt and Bunker²⁰ have suggested that more attention should be paid to the fit between skills and attributes with intellectual content and demands of primary medical care, by emphasising the lifestyle issues (flexibility or work–life balance), social orientation (patient focused or community based), and the opportunity to gain significant and varied clinical experience in the primary care setting.

Retention of GPs

Few studies explicitly examined how to retain primary care physicians in practice. In the UK, the numbers of GPs registering to work abroad has significantly increased in the past 3 years, and GPs' intention to quit practice has been increasing: from 8.9% in 2012 to 13.1% in 2015 among GPs <50 years old, and from 54.1% in 2012 to 60.9% in 2015

Table 2. Summary of evidence to support GP recruitment and retention, using a framework adapted from the 10-point plan from *Building the Workforce — the New Deal for General Practice* document.¹⁵

	10-point plan	Evidence from GP literature
Recruitment	1. Promoting general practice	No clear evidence <ul style="list-style-type: none"> • Enhancing the status, contribution, career advancement, and rewards of primary care practitioners • Role models • Medical environment important
	2. Improving the breadth of training (for candidates seeking to work in geographies where it is hard to recruit trainees)	Some evidence both for candidates seeking to work in geographies where it is hard to recruit trainees, and for GP trainees seeking to work everywhere <p><i>Exposure to general practice:</i></p> <ul style="list-style-type: none"> • Early exposure/pre-registration house officer scheme • Workplace experience and interaction with members of the profession • Length of time spent in general practice rotation • Ensuring that the rotations are of high quality, with dedicated generalists' faculty <p><i>Curricula modifications:</i></p> <ul style="list-style-type: none"> • Effective medical school curricula in primary care • Establish primary care honours or scholars' tracks • Develop or expand primary care fast-track programmes • Subspecialisation, portfolio careers, and profile of new skills <p><i>Recruitment/admission:</i></p> <ul style="list-style-type: none"> • Modification of selection criteria
	3. Training hubs	Some evidence in the rural training and context literature <p><i>Rural training, rural context literature:</i></p> <ul style="list-style-type: none"> • Familiarity with community health resources, sociocultural awareness in patient care, community participation and assimilation, and identifying and intervening in the community's health problems
	4. Targeted support	Some evidence in the rural training and context literature, but no clear evidence in general practice <ul style="list-style-type: none"> • Link choice of career in primary care to loan forgiveness • Funding in primary care research • Increase and assure funding for fellowship training in primary care • Direct training funds to schools with track records of producing graduates in primary care
	Other	<i>Determinant factors in specialisation choice:</i> <ul style="list-style-type: none"> • Fit between skills and attributes with intellectual content and demands of the specialisation • Stimulating and interesting • Lifestyle factors (flexibility, work-life balance, or quality of life) • Social orientation and desire for a varied scope of practice • Significant experience in the primary care setting
Retention	5. Investment in retainer schemes	No clear evidence <p><i>Widening the scope of remuneration and contract conditions:</i></p> <ul style="list-style-type: none"> • Reduce the income differential between general practice and hospital work • Remove the disincentives for less than full-time employment, widening of the employment mechanisms open to GPs, such as authority-organised salaried schemes
	6. Improving the training capacity in general practice	No clear evidence <p>Subspecialisation and portfolio careers where doctors might gain skills in a range of specialties and practices, some or all of them at any one time</p>
	7. Incentives to remain in practice	No clear evidence
	8. New ways of working	No clear evidence <p><i>Varying time commitment across the working day and week:</i></p> <ul style="list-style-type: none"> • Part time, job share, temporary, and short time available, GP's employment status and career stage <p><i>Offering a wider choice of long-term career paths:</i></p> <ul style="list-style-type: none"> • Locum and associate positions equal to full-time principal posts • Activities such as research and training in management skills • A part-time educational post or hospital attachment • Job mobility as a way to progress (a more positive vision of mobility)
	Other	Evidence <p><i>Increased satisfaction (factors):</i></p> <ul style="list-style-type: none"> • Job autonomy/diversity/variety • Social support, relationship and collaboration with colleagues/patients • Academic hospital and centres/teaching medical students and advanced students <p><i>Decreased satisfaction (factors):</i></p> <ul style="list-style-type: none"> • Too many working hours, low income/compensation/workload/not enough time/ high demands/lot of paperwork/little free time • Lack of support/lack of colleagues • Lack of recognition • Bureaucracy/practice administration

among GPs aged ≥ 50 years.¹⁴ Retention can be influenced by a variety of intrinsic and extrinsic factors, including remuneration, income and salary retention schemes, job satisfaction, and career pathway and portfolio.^{15,16,37}

Although remuneration and retention schemes, such as increases in salary or lump sum payments, are used by the government to retain doctors, there is little evidence of the positive and effective impact of these schemes. Low pay might be a source of dissatisfaction with the job,²⁷ but the evidence suggests that increases in income would not compensate for other sources of job dissatisfaction, such as workload.³⁷

Job satisfaction and job dissatisfaction are significant predictors of GP retention and turnover,^{38,39} reflecting the findings of research in the wider management and organisational behaviour literature.^{40,41} Job satisfaction varies from time to time within an individual's career stages. Therefore, it is important to understand both the determinants influencing job satisfaction and dissatisfaction, and also the factors that increase strain in the workplace and in general practice. Job satisfaction and dissatisfaction are related to three factors: job stressors (for example, workload), job characteristics and attributes (for example, job autonomy), and other conditions (for example, practice geographical location).

Job dissatisfaction is most influenced by work-related variables. In particular, these include increased workload intensity and volume to meet the requirements of external agencies, having insufficient time to do the job justice, increased administration and bureaucracy, increased demand and expectation from patients, increasing work complexity, lack of support from colleagues, lack of professional recognition, and long working hours.^{14,39,40,42} More recently, adverse publicity from the media, changes imposed from local primary care organisations, and insufficient resources within the practice have all increased job dissatisfaction.¹³ There is evidence to show that increased work stress and work intensity leads GPs under 'high strain' to report higher levels of anxiety, depression, and dissatisfaction than GPs under 'low strain', and that the health impacts of stress continued outside of work, which in turn could increase job dissatisfaction and intention to quit the profession.^{43,44}

Job satisfaction is also influenced by expectations about future events.⁴⁵ If doctors perceive that their workload will not reduce, and that demands will always increase, it is

likely that they will feel more overwhelmed and less satisfied with their job, and thus more likely to quit. Therefore, feeling more stressed, disillusioned, and overwhelmed amplifies the negative portrayal of GPs in the media and by government, further negatively affecting GPs' spirit and professional identity.⁴⁶

There is some evidence that job autonomy, the variety of work, the feeling of doing an important job, social support, and a good practice environment positively affect job satisfaction.^{14,39,47} However, GP surveys suggest that a number of these attributes have changed between 2012 and 2015; such as the autonomy in deciding how to do their job and what work to do, the variety of work, and flexibility of working.¹⁴

Changes to general practice over the last 10–15 years have been substantial, and job dissatisfaction could be a result of the changing roles necessitated by professional and organisational changes.^{38,47} However, job satisfaction is also influenced by a number of other factors, such as the local practice context, work–life flexibility, personal development, and the emotional impact of working as a GP.^{42,47} Wordsworth *et al*⁴⁸ suggested that enhancing the patient care aspects of a GP's work is more likely to act as a key for retention, and that lack of consultation on changes can lead to dissatisfaction.⁴⁹ Flexibility and part-time working have always been seen as factors that make general practice a more attractive working environment, although this is increasingly seen to be less relevant.^{48,50–52}

Mentorship schemes and opportunities to develop portfolio careers would be welcome at every stage of a GP's career, not just for senior doctors or towards the end of working lives.^{20,26,29} Two papers suggest that a wider choice of long-term career paths, such as subspecialisation and portfolio careers (for example, dermatology or paediatrics), is important for both the recruitment and retention of GPs. It is also suggested that an increase in satisfaction of intellectual and altruistic needs, and functional flexibility within their practice, could improve satisfaction and fulfilment, and consequently GPs' retention.^{20,29} Providing learning and development activities, such as developing management skills, could support GP recruitment and retention, providing an opportunity for students to map out development pathways and provide variety within a physician's role.

DISCUSSION

Summary

Three elements are relevant to GP

recruitment: individual, institutional, and professional factors. In addition, providing students with appropriate opportunities for contact with, and positive exposure to, general practice and GPs is critical, as well as widening the opportunities for students and GPs so that junior doctors' specialisation choices can reflect more individual student characteristics. The main determinants of retention are job satisfaction (versus dissatisfaction), the influence of job stress, job attributes and characteristics, and other conditions, such as the geographical location of the practice. All seem related to career pathways and portfolio.

Based on this review of the evidence, the authors would support strategies that provide long-term investment in general practice. Current proposals to increase the proportion of NHS funding in primary care are therefore welcome. The evidence suggests that providing the right environment and opportunity for GPs to focus on supporting patients as medical professionals is crucial, requiring strategies that reduce workload while retaining the core attributes of general practice. However, strategies should also include opportunities for GPs to develop wider interests and skills, and should take into consideration both recruitment and retention simultaneously. From this review, there appear to be three key lessons that should underpin national and local policies:

- review the curricula in medical schools and emphasise the importance of exposure to general practice;
- job satisfaction is the main predictor of retention and is influenced by workload stress and future anticipation, and thus strategies that reduce workload are required; and
- financial inducements (golden handcuffs) are not necessarily effective.

Strengths and limitations

Overall, the published evidence in relation to GP recruitment and retention is limited and mostly focuses on attracting GPs to rural areas — particularly in Australia. The review shows an overlap in the determinants of

recruitment and retention.⁴⁷ Despite this, the evidence suggests that there are some potential factors that may usefully support the development of specific strategies for supporting the recruitment and retention of GPs. These are summarised in Table 2 and Appendix 2. Although most strategies proposed by the 10-point plan from the document *Building the Workforce — the New Deal for General Practice* and the *General Practice Forward View* are not based on strong evidence, some determinants might help with the GP workforce crisis.^{15,16}

Implications for research and practice

Newton *et al* found that retirement at 60 years old was a goal for both happy GPs — in order to do other things or because they feel they have 'done their bit' — and those GPs who no longer had the resilience to cope with work stress.⁵⁰ In their study, Roos *et al* showed that, although 83.7% of GP trainees and newly qualified GPs would choose to be a physician again, only 78.4% would choose general practice as a specialisation.³⁶ One clear message from the literature is that expectations about the future — whether as a new GP or because of future developments in general practice — affect both recruitment and retention.^{45,53}

One area not fully explored in the literature identified for this review was the recruitment policy of medical schools, given that that there are career choice determinants influencing the recruitment of GPs in medical school. It would be interesting in the future to explore the role of health policy on the specific recruitment policy of medical schools, and this is likely to be influenced by the findings of the joint HEE and Medical Schools Council review chaired by Professor Val Wass.^{54,55} The *General Practice Forward View* has suggested recruitment at the international level. International recruitment was outside the scope of this review. A post-hoc analysis shows a lack of evidence of the long-term beneficial effects of such recruitment strategy.^{56–60} Short-term policies, such as international recruitment, financial bonuses, and other incentive packages, may respond to immediate needs, but are not long-term solutions.

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Provenance

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Competing interests

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Appendix 1. Search terms

Key terms	Combined with:
General practitioner	Recruitment
GPs	Recruitment strategy ^a
General practice	Personnel recruitment
Family practitioner ^a	Employment
Family practice	Career choice
Family physician ^a	Personnel turnover
Family doctor ^a	Motivation
Primary care physician ^a	Retention
Primary care doctor ^a	GP retention
Primary care practitioner ^a	Retirement Early retirement

^a Truncation.

Appendix 2. Characteristics of included reviews on determinant of recruitment and retention of GPs

Authors	Year	Countries	Article type	Topic	Method	Relevance	Quality
Buchbinder SB <i>et al</i> ⁴⁶	2001	US	Cohort study	Primary care physician, job satisfaction and turnover	Questionnaire survey	Weak: cohort from the US and data from 1987 to 1991	Good
Buciuniene I <i>et al</i> ⁴²	2005	Lithuania	Original research	Healthcare reform and job satisfaction	Self-administered anonymous questionnaires	Weak: GPs and policy from Lithuania	Average/weak: cross-sectional and statistical analyses simplistic (no regression, only correlations)
Bustanza R <i>et al</i> ³⁴	2009	Canada	Cohort study	Training programme, GP retention in rural area	Used of secondary data and questionnaires	Average: Canada has a similar primary care context but the study was in a rural context	Good
Campos-Outcalt D <i>et al</i> ³⁰	1995	US	Review/quality assessment	Curricula, role models, research support, career choice	Literature search: Medline, PsycINFO, Current Contents, Expanded Academic Index	Average, the article presents three elements influencing career choice, but the article is quite old	Average: the methods are very detailed. Very few articles were included in the results section due to the lack of quality articles fitting their 70 criteria
CWJ ⁵¹	2014	UK	Review/report	GP workforce	N/A	High	Good: because it gives an overview of the GP workforce in the UK
Chellappah M, Garnham L ²¹	2014	UK	Original research	Medical student attitude towards general practice	Questionnaire design	High	Weak: not generalisable (specific to one college). Measurement scale not used
Crampton PES <i>et al</i> ²²	2013	Australia, US, Canada, NZ, South Africa, Japan	Systematic literature review	Undergraduate clinical placements, underserved areas	Database searches, inclusion and exclusion criteria, data extraction, and so on	Weak	High
Dale J <i>et al</i> ⁴³	2015	UK (West Midlands)	Cross-sectional study	Retention of GPs	Online questionnaire with free-text section	High	Good: because it questioned the proposition that general practice is in crisis
Dayan M <i>et al</i> ³⁷	2014	UK	Report	GP workforce crisis	N/A	Good	Average
Doran N <i>et al</i> ⁴⁷	2016	UK	Mixed-methods research	Why GPs leave the NHS	Online questionnaire with qualitative interviews	High	Good
Evans J <i>et al</i> ⁵²	2000	UK	Cohort study	Medical graduates and flexible/part-time working in medicine	Survey with free-text comment. Reported mainly the qualitative data	Weak: medical graduate in general not only future GPs, also the data come from 1977, 1988, and 1993	Average: used mainly qualitative data coming from the free-text comment. The percentage of comment on flexible and part time is less than 9% for the three cohorts
Feeley TH ⁵³	2003	N/A	Narrative literature review	Retention in rural primary care physicians	N/A	Weak	Weak

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Appendix 2 continued. Characteristics of included reviews on determinant of recruitment and retention of GPs

Geyman JP <i>et al</i> ³³	2000	US	Study	Educating GPs for rural practice	Comprehensive literature search: Medline, Health STAR databases	Weak, but the recommendations are interesting	Average/weak: little analysis, only looked at programmes
Gibson J <i>et al</i> ¹⁴	2015	UK	Report, survey	GP work/life survey	Questionnaire	Good	Average: it is a report.
Groenewegen PP <i>et al</i> ⁴⁴	1991	US	Review of the literature	GP, effective workload, job satisfaction	N/A	Good	Average: no method but definition and theorisation is interesting
Halaas GW <i>et al</i> ²⁴	2008	US	Study	Recruitment and retention of rural physicians	Analysed data from a recruitment programme	Good, but the results are linked to the rural context	Average: no hypothesis, nor hypothesis testing, but 37-year trend studied
Harding A <i>et al</i> ²	2015	UK	Cross-sectional study	Teaching and general practice	Review of past national survey and questionnaire survey	Good	Good
Hemphill E <i>et al</i> ⁶¹	2007	Australia	Mixed design	GP rural recruitment	Three sources of data collection: GP survey, data collected from a convenient sample of students, and interviews with recruiting agencies	Weak	Average
Humphreys J <i>et al</i> ⁴⁹	2001	Australia	Critical review	Rural medical workforce retention	Australian and international database: ATSI Health, Consumer service, AusportMed, Family & Society, and so on	Good	Average: issues with method inclusion/exclusion criteria
Illing J <i>et al</i> ²⁵	2003	UK	Review of evidence	Learning in practice (preregistration house officers) and general practice	Literature search: Embrace, Medline, ERIC, FirstSearch, PsycINFO, www.timeit.org.uk, www.educationgp.com	Good	Average: methods inclusion and exclusion criteria not presented
Landry M <i>et al</i> ²⁶	2011	Canada	Original study	Recruitment and retention of doctors and local training (rural)	Short survey	Good but the results are linked to the rural context	Good: methods well presented, the analyses are adequate
Lee DM, Nichols T ²⁷	2014	US, Canada	Case study, review	Physician recruitment and retention, rural and underserved areas	Literature review	Weak: but suggestions for different factors influencing recruitment and retention	Average: the review method is described but the case study choice is not explained
Newton J <i>et al</i> ⁵⁰	2004	UK (Northern Deanery)	Original study	Job dissatisfaction and early retirement	Qualitative study: interviews, using a purposefully drawn sample from seven sub-groups of responders	Good	Average: small number of interviewees
O'Connor DB <i>et al</i> ⁴⁵	2000	UK (Liverpool)	Preliminary study	Job strain and blood pressure in general practice	Questionnaire and ambulatory blood pressure procedure	High: relationship between job strain and blood pressure	Good

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Appendix 2 continued. Characteristics of included reviews on determinant of recruitment and retention of GPs

Petchey R <i>et al</i> ²³	1997	UK	Original study	Junior doctors' perceptions of general practice as a career	Qualitative study: interviews, using an heterogeneous sample	High	Weak: little theoretical, development
Roos M <i>et al</i> ³⁶	2014	Czech Republic, Denmark, Germany, Italy, Norway, Portugal, UK	Original cross-sectional study	Motivation for career choice and job satisfaction: GP trainees and newly qualified GPs	Questionnaire/survey	High	Good
Rosenthal TC ³²	2000	US	Review	Rural training tracts	N/A	Weak: but interesting insight	Weak
Schwartz MD <i>et al</i> ²⁸	2005	US	Reflection	Student interest in generalist career	N/A	High	Weak: recommendations without original study, nor based on evidence from various articles
Shadbolt N, Bunker J ²⁰	2009	Australia	Review	Career choice determinants	N/A	High	Weak: no method
Sibbald B <i>et al</i> ³⁹	2003	England	National survey	Job satisfaction and retirement	Survey	High	Good
Stapleton G <i>et al</i> ⁴²	2014	English-speaking countries	Review, ethical criteria	Primary care physicians	Database: Web of Knowledge	Weak	Average: presentation of methods
Van Ham I <i>et al</i> ⁴⁰	2006	UK, US, Australia	Systematic review	GPs and job satisfaction	Two strategies: database and snowball methods	High	High
Verma P <i>et al</i> ¹⁹	2016	UK, US, Canada, Australia, Japan, NZ, Norway, Chile	Systematic review	Strategies to recruit and retain	Literature search: Medline, Embase, and Central, 1974–2013	High	High
Williamson JW <i>et al</i> ³¹	1993	US	Comparative studies	Primary care, health systems change	N/A	Weak	Weak: no method
Wordsworth S <i>et al</i> ⁴⁸	2004	UK	Original study	Preferences for general practice jobs	Discrete-choice experiment	Good	Good
Young R, Leese B ³⁹	1999	UK	Discussion paper/review	Recruitment and retention of GPs in the UK	Literature search: Medline, BIDS-EMBASE, IBSS, HELMIS, survey of articles in recent issues of relevant professional journals	High	Average: little theoretical development and evidence

ATSI = Aboriginal and Torres Strait Islander; CWI = Centre for Workforce Improvement; ERIC = Education Resources Information Centre; HELMIS = Health Management Information Service; IBSS = International Bibliography of the Social Sciences.